Technical Memorandum

Long Island Sound Dredged Material Management Plan

Evaluation of Air Quality Compliance for Disposal of Dredged Material

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1 Introduction

Air quality refers to the state of the air around us. Good air quality refers to clean, clear, unpolluted air and poor air quality occurs when pollutants reach high enough concentrations to endanger human health and/or the environment. Air quality in the United States (U.S.) is determined by comparing ambient air concentrations of specific pollutants identified by the United State Environmental Protection Agency (USEPA) to criteria or guidelines that are considered to be acceptable exposure levels.

Air quality can be affected by air pollutants produced by mobile sources and stationary sources, which are fixed or immobile facilities. Mobile sources include vehicular traffic, construction and dredging equipment, diesel locomotives, etc., while stationary sources include industrial stacks, vents, parking garages, diesel freight yards and other fixed sources.

Potential local and regional air quality impacts could occur from the dredging and dredged material disposal operation activities from individual project alternatives that are being studied as part of the Long Island Sound Dredged Material Management Plan (LIS DMMP). This memorandum evaluates the potential implications and demonstrates air quality compliance of LIS DMMP-associated projects.

This technical memorandum is organized as follows:

- Chapter 1 provides and introduction to the evaluation of air quality compliance of LIS DMMP - associated projects.
- Chapter 2 discusses the regulatory framework, including criteria and other pollutants, National and State Ambient Air Quality Standards, Clean Air Act Conformity Rule, the environmental review process, and regulations applicable to LIS DMMP- associated projects.
- Chapter 3 covers the air emissions analysis methodology including input, emissions factor modeling, compliance, and potential mitigation measures.
- Chapter 4 provides the cost analysis including both dredged material disposal cost and emission offset cost.
- Chapter 5 consists of the Emissions Workbook User's Brief Guide

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2 Regulatory Framework

2.1 Criteria Pollutants and National and State Ambient Air Quality Standards

The USEPA, under the requirements of the 1970 Clean Air Act (CAA) as amended in 1977 and 1990, has established National Ambient Air Quality Standards (NAAQS) for six contaminants, referred to as criteria pollutants (40 CFR 50). The six criteria pollutants are carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter with diameters up to 10 µm (PM_{10}), particulate matter with diameters up to 2.5 µm ($PM_{2.5}$), lead (Pb), and sulfur dioxide (SO_2). The NAAQS standards include primary and secondary standards.

The primary standards were established at levels sufficient to protect public health with an adequate margin of safety. The secondary standards were established to protect the public welfare from the adverse effects associated with pollutants in the ambient air, such as damage to plants and ecosystems.

On January 22, 2010, USEPA announced a new 1-hour NO_2 standard of 100 parts per billion (ppb) while retaining the annual average NO_2 standard. The 1-hour standard was adopted to protect against health effects associated with short-term exposures to NO_2, which are generally highest on and near major roads. The final rule for the new hourly NAAQS was published in the Federal Register on February 9, 2010, and the standard became effective on April 12, 2010.

On June 22, 2010, the USEPA issued a final rule effective on August 23, 2010 updating the NAAQS for sulfur dioxide (SO_2) (75 Federal Register 35520). The USEPA revised the primary SO_2 NAAQS to provide requisite protection of public health with an adequate margin of safety by establishing a new 1-hour SO_2 standard at a level of 75 parts per billion (ppb), based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The USEPA also revoked both the then existing 24-hour and annual primary SO_2 standards.

On January 15, 2013, the USEPA issued a final rule effective on March 18, 2013 updating the NAAQS for fine particle pollution (particulate matter less than or equal to 2.5 microns in diameter [$PM_{2.5}$]) (78 Federal Register 3086). The USEPA revised the annual $PM_{2.5}$ primary standard by lowering the level from 15.0 to 12.0 micrograms per cubic meter ($\mu g/m^3$). The primary standards were established to protect human health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

The 24-hour $PM_{2.5}$ primary standard is being retained at a level of 35 $\mu g/m^3$. The USEPA is revising the Air Quality Index for $PM_{2.5}$ to be consistent with the final primary $PM_{2.5}$ standards. With regard to the primary standard for coarse particles (particulate matter less than or equal to 10 microns in diameter [PM_{10}]), the USEPA is retaining the current 24-hour PM_{10} standard of 150 $\mu g/m^3$. There is no annual standard for PM_{10}.

In order to implement the new standard, new monitoring requirements mandate that monitors be placed where emissions impact populated areas. States will need to make adjustments to the existing monitoring network in order to ensure that monitors meeting the network design regulations for the new standards are sited and operational in the future. Therefore the USEPA has not designated areas which do not meet the new standards.

Table 2-1
National Ambient Air Quality Standards for Criteria Pollutants

Pollutant		***Primary/Secondary***	***Averaging Time***	***Level***	***Form***
Carbon Monoxide		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead		Primary and Secondary	Rolling 3- month average	0.15 µg/m[(1)]	Not to be exceeded
Nitrogen Dioxide		Primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		Primary and Secondary	Annual	53 ppb[(2)]	Annual mean
Ozone		Primary and Secondary	8-hour	0.075 ppm[(3)]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution	$PM_{2.5}$	Primary	Annual	12 µg/m[(3) (4)]	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m[(3)]	Annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 µg/m[(3)]	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24-hour	150 µg/m[(3)]	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		Primary	1-hour	75 ppb[(5)]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Notes (as of May 2013):
[(1)] Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
[(2)] The official level of the annual nitrogen dioxide standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of a clearer comparison to the 1-hour standard.
[(3)] Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.
[(4)] Final rule signed January 15, 2013. The primary annual fine particle ($PM_{2.5}$) standard was lowered from 15 to 12 µg/m^3.
[(5)] Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.
Source: USEPA 2012.

2.2 Pollutants of Concern

The potential activities being studied under the LIS DMMP involve operation of mobile sources primarily consisting of motor vehicles, such as on-road trucks, construction and dredging non-road equipment, in-water vessels, and diesel locomotives. Primary air pollutants of concern are CO, PM (PM_{10} and $PM_{2.5}$) and O_3 precursors (nitrogen oxides [NO_x] and volatile organic compounds [VOCs]). Lead emissions from mobile sources have been virtually eliminated through the use of unleaded fuel, and are no longer of concern for mobile sources. Potential emissions of SO_2, also a $PM_{2.5}$ precursor, from mobile sources are insignificant in comparison with non-mobile emission sources, especially after the implementation of the USEPA's Clean Diesel Truck and Bus Rule (December 21, 2000) and Clean Air Nonroad Diesel Rule (May 11, 2004) that cut 99 percent of sulfur in diesel fuel. Therefore, potential air quality impacts of mobile source emissions of CO, PM (PM_{10} and $PM_{2.5}$), NO_x, and VOCs are of possible concern and should be considered under the LIS DMMP.

Since no conventional stationary sources (i.e., the sources that are regulated under CAA Title V permit regulation) are induced from the dredging and dredged material disposal process, no state air permit regulations are applicable to the program.

2.3 NAAQS Attainment Status

Areas that meet the NAAQS standard for a criterion pollutant are designated as being "in attainment." Areas where criterion pollutant levels exceed the NAAQS are designated as "nonattainment." Ozone (O_3) nonattainment areas are further classified, based on the severity of the pollution problem, as marginal, moderate, serious, severe, or extreme. CO and PM_{10} nonattainment areas are classified as either moderate or serious.

A maintenance area is an area that has been redesignated as an attainment area from a former nonattainment area. However, during the maintenance period, most of the CAA rules for a nonattainment area are still applicable to a maintenance area.

The CAA, as amended in 1990, mandates that states with nonattainment areas adopt State Implementation Plans (SIPs) that target the elimination or reduction of the severity and number of violations of the NAAQS. SIPs set forth policies to expeditiously achieve and maintain attainment of the NAAQS. The SIP aims to improve air quality and includes an analysis of reasonably available control measures; an attainment demonstration; contingency plans for attainment; and stationary and mobile source budgets to address both stationary and mobile source emissions within the region covered. If an area has been redesignated as an attainment area from a former nonattainment area, the state is required to develop a long-term maintenance plan to ensure that the area remains continuously in attainment for the NAAQS.

In each state's SIP or Transportation Improvement Program (TIP) that conforms with the SIP, mobile source emissions budgets for non-road equipment operations from construction-related activities were established. These budgets are based on the anticipated regional non-road equipment usage growth (occurring over a baseline condition) and the gradual improvement in equipment emissions due to federal and/or state mobile source emissions control programs, such as engine-tiered performance standards and inspection and maintenance programs. An on-road regional motor vehicle emissions budget was also established to include the on-road truck component.

The current NAAQS designations for areas around Long Island Sound, within which the study area lies, are summarized below.

2.3.1 New York-Northern New Jersey-Connecticut-Long Island Metropolitan Nonattainment Region

Table 2-2 lists the counties where the existing ambient air quality conditions are of concern with respect to certain pollutants. The New York-Northern New Jersey-Connecticut Long Island Nonattainment Area is required to implement controls through SIP development for these pollutants.

Table 2-2
New York-Northern New Jersey-Connecticut Metropolitan Nonattainment and Maintenance Areas

O_3 Nonattainment Area (County)	$PM_{2.5}$ Nonattainment and Maintenance Area (County)	PM_{10} Nonattainment Area (County)	CO Maintenance Area (County)
New York Bronx Kings Nassau Suffolk New York Queens Richmond Westchester Rockland ***Northern New Jersey*** Bergen Essex Hudson Hunterdon Middlesex Monmouth Morris Passaic Somerset Sussex Union ***Connecticut*** Fairfield Middlesex New Haven	***New York Nonattainment*** Bronx Kings Nassau Suffolk New York Queens Richmond Westchester ***Northern New Jersey Maintenance*** Bergen Essex Hudson Mercer Middlesex Monmouth Morris Passaic Somerset Union ***Connecticut Maintenance*** Fairfield New Haven	***New York*** New York	***New York*** Bronx Kings Nassau New York Queens Richmond Westchester ***Northern New Jersey*** Bergen Essex Hudson Passaic Union ***Connecticut*** Fairfield Litchfield

Ozone

On August 9, 2007, the New York State Department of Environmental Conservation (NYSDEC) submitted a proposed revision to the O_3 SIP for demonstrating attainment by June 15, 2013. This SIP revision contains the 2002 baseline emission inventory, projection inventories for 2008, 2011 and 2012, a predictive photo-chemical modeling attainment demonstration by June 15, 2013, and the control measures and programs that will be implemented by the state in order to demonstrate attainment with the 8- hour O_3 standard.

In order to improve air quality conditions within nonattainment or maintenance areas, the Connecticut Department of Energy and Environmental Protection (CTDEEP), who is responsible to develop the SIP to achieve attainment or maintain attainment of the NAAQS, submitted the O_3 SIP to USEPA on December 28, 2012. The SIP satisfies the requirements related to the CAA section 110(a)(1) and (2) for the O_3 NAAQS including such basic requirements as emissions inventories, monitoring and modeling to assure attainment and maintenance of the NAAQS.

Particulate Matter

On October 27, 2009, NYSDEC submitted a proposed SIP revision entitled "*New York State Implementation Plan for $PM_{2.5}$ (Annual NAAQS): Attainment Demonstration for the New York Metropolitan Area*." This SIP, or attainment demonstration, includes inventory data for both the base and projection years, proposed emission limits, and modeling results showing the effect of the control measures needed to reach attainment. The CAA requires that attainment be reached as expeditiously as practicable, but no later than the beginning of the year prior to the attainment date. Additionally, this SIP contains a discussion of the applicable Reasonable Further Progress requirements, as well as contingency measures that apply.

Based on historical data showing no exceedances of PM_{10} NAAQS, NYSDEC withdrew the PM_{10} SIP and submitted a request on January 14, 2013 to USEPA for redesignation of the nonattainment area classified originally in 1995.

On June 22, 2012, CTDEEP submitted the final $PM_{2.5}$ redesignation request and maintenance plan as the $PM_{2.5}$ SIP, for Connecticut's portion of the New York-New Jersey-Connecticut $PM_{2.5}$ nonattainment area. The plan demonstrated that Connecticut’s air quality met both the 1997 annual and the 2006 24-hour $PM_{2.5}$ NAAQS due to a combination of national, regional and local control measures implemented to reduce emissions and presented a maintenance plan that ensures continued attainment through the year 2025. On September 24, 2013, USEPA published its approval of the $PM_{2.5}$ redesignation request, establishing October 24, 2013 as the effective date of redesignation to attainment for Connecticut’s portion of the New York-New Jersey-Connecticut area for both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS.

Carbon Monoxide

New York City, Westchester, and Nassau counties are designated as part of New York-Northern New Jersey-Long Island CO maintenance area. In November 1999, NYSDEC submitted a request to the USEPA to redesignate the New York portion of the CO nonattainment area from nonattainment to attainment of the NAAQS.

The USEPA approved the request because the New York portion met the redesignation requirements set forth in the CAA and New York’s CO maintenance plans provide for the continued attainment of the CO NAAQS. CO emissions in the region have been significantly reduced in recent years due in large part to vehicle inspection and maintenance requirements and cleaner-burning fuels.

2.3.2 Greater Connecticut Region

In the Greater Connecticut region, the nonattainment or maintenance designation areas are summarized in Table 2-3. Hartford, Litchfield, New London, Tolland, and Windham Counties comprise the Greater Connecticut moderate nonattainment area for the O_3 standard, a second nonattainment area within Connecticut.

Table 2-3
Greater Connecticut Nonattainment and Maintenance Areas

O_3 Nonattainment Area (County)	PM_{10} Maintenance Area (County)	CO Maintenance Area (County)
Hartford Litchfield New London Tolland Windham	City of New Haven	Middlesex New Haven Hartford Tolland

Also included in this maintenance area are some cities and townships in Connecticut such as: all cities and townships in Fairfield County and Bridgewater and New Milford townships in Litchfield County

2.3.3 Providence Region

The Providence, Rhode Island Region has been designated as a nonattainment area for O_3 with a county list consisting of all five counties in the state shown in Table 2-4.

Table 2-4
Rhode Island Nonattainment Areas

O_3 Nonattainment Area (County)
Bristol Kent Newport Providence Washington

In February 30, 2008, the Rhode Island Department of Environmental Management (RIDEM) submitted the "*State Implementation Plan (SIP) to Demonstrate Attainment of the Eight-Hour National Ambient Air Quality Standard for Ozone in the Rhode Island Nonattainment Area*" to the USEPA to demonstrate that the Rhode Island nonattainment area, which is the entire State of Rhode Island, will be in attainment of the 8-hour NAAQS for O_3 by the end of the 2009 O_3 season. The SIP also demonstrates that, by 2008, Rhode Island will achieve the Reasonable Further Progress goals that are prescribed by the CAA and subsequent USEPA guidance.

2.4 Clean Air Act Conformity Rule

The Clean Air Act Amendments (CAAA) of 1990 expanded the scope and content of the act's conformity provisions in terms of their relationship to a SIP. Under Section 176(c) of CAAA, a project is in "conformity" if it corresponds to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving their expeditious attainment. Conformity further requires that such activities would not:

- Cause or contribute to any new violations of any standards in any area.
- Increase the frequency or severity of any existing violation of any standards in any area.

- Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The CAAA prohibits federal agencies from engaging in, supporting, providing financial assistance for, licensing, permitting, or approving any activity that does not conform to an applicable SIP. Federal agencies must determine that a federal action conforms to the SIP before proceeding with the action.

2.4.1 General Conformity and Transportation Conformity Rules

The USEPA has developed two sets of conformity regulations for federal actions, differentiated into transportation projects and non-transportation-related projects as follows:

- Transportation projects funded, developed or approved under the Federal Aid Highway Program or Federal Transit Act, which are governed by the "transportation conformity" regulations (40 CFR Parts 51 and 93), effective on December 27, 1993 and revised on August 15, 1997.
- Non-transportation projects that require an approval from federal agencies other than Federal Highway Administration or Federal Transit Administration, which are governed by the "general conformity" regulations (40 CFR Parts 6, 51 and 93) described in the final rule for *Determining Conformity of General Federal Actions to State or Federal Implementation Plans* published in the *Federal Register* on November 30, 1993. The general conformity rule (GCR) became effective January 31, 1994 and was revised on March 24, 2010.

The LIS DMMP is not a transportation program under the criteria described above, and therefore, the GCR applies.

The GCR contains exemptions from the general conformity process. Certain federal actions are deemed by USEPA to conform because of the thorough air quality analysis that is necessary to comply with other statutory requirements. Examples of these actions include those subject to the New Source Review (NSR) program, Prevention of Significant Deterioration (PSD) permits, and remedial activities under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Other federal actions that are exempt from the GCR process include those actions which would result in no increase in emissions, or an increase in emissions that is clearly *de minimis*. Examples include continuing or recurring activities, routine maintenance and repair, administrative and planning actions, land transfers, and routine movement of mobile assets.

2.4.2 General Conformity *de minimis* Levels

To focus general conformity requirements on those federal actions with the potential to have significant air quality impacts, threshold (*de minimis*) rates of emissions were established in the final rule. A formal conformity determination is required when the annual net total of direct and indirect emissions from a federal action occurring in a nonattainment or maintenance area for a criteria pollutant would equal or exceed the annual *de minimis* level for that pollutant. Table 2-5 lists the *de minimis* levels for each criteria pollutant.

Table 2-5
De *Minimis* Emission Levels for Criteria Air Pollutants

Pollutant	Nonattainment Designation	Tons/Year
Ozone*	Serious	50
	Severe	25
	Extreme	10
	Other nonattainment or maintenance areas outside ozone transport region	100
	Marginal and moderate nonattainment areas inside ozone transport region	50/100**
Carbon Monoxide	All	100
Sulfur Dioxide	All	100
Lead	All	25
Nitrogen Dioxide	All	100
Particulate Matter ≤ 10 microns	Moderate	100
	Serious	70
Particulate Matter ≤ 2.5 microns***	All	100
Notes: * Applies to ozone precursors – volatile organic compounds (VOC) and nitrogen oxides (NO_X); ** VOC/NO_X; *** Applies to $PM_{2.5}$ and its precursors.		

Based on the nonattainment and maintenance areas listed in Tables 2-2 to 2-4, the applicable *de minimis* levels for those federal action projects (e.g., US Army Corps Engineers [USACE] approval action) within those nonattainment or maintenance areas would include, where appropriate:

- 100 tons per year (tpy) for NOx
- 50 tpy for VOC
- 100 tpy for $PM_{2.5}$
- 100 tpy for CO.

Since the disposal activities within the only PM_{10} nonattainment/maintenance areas (i.e., New York County and the City of New Heaven as shown in Tables 2-2 and 2-3) would be limited, the evaluation of compliance does not consider the effects with these areas.

2.5 General Conformity Rule Emissions Analysis

The GCR analysis for a Federal action examines the impacts of the direct and indirect net emissions from mobile and stationary sources. Direct emissions are emissions of a criterion pollutant or its precursors that are caused or initiated by a Federal action and occur at the same time and place as the action. Indirect emissions, occurring later in time and/or farther removed in distance from the action itself, must be included in the determination if both of the following apply:

- The federal agency can practicably control the emissions and has continuing program responsibility to maintain control.

- The emissions caused by the federal action are reasonably foreseeable.

Increased direct and indirect NO_x, VOC, $PM_{2.5}$, and CO emissions would result from the following potential demolition and construction activities associated with the potential actions being studied under the LIS DMMP:

- Use of diesel and gas-powered dredging and dredged material disposal non-road construction equipment.
- Movement of trucks, vessels, and locomotives during dredged material disposal activities.
- Commuting vehicles from dredging and construction workers.

Under the GCR, emissions of any LIS DMMP projects and/or project components involving federal funding or federal agency approval need to be compared to *de minimis* levels on an annual basis. If the total direct and indirect emissions for the applicable nonattainment or maintenance criterion pollutant (or its relevant precursors) do not exceed the *de minimis* levels, the federal action is determined to conform for the pollutant under study with minimal potential air quality impact. Conversely, if the total annual emissions of a pollutant are above the *de minimis* value, a formal GCR determination is applicable for that pollutant.

There are basically four ways to demonstrate conformity with the SIP under the formal GCR determination:

- Emissions are included in the SIP – so that for any criteria pollutant, the total of direct and indirect emissions from the action are specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration.
- Emission offsets are identified – so that the total emissions (including direct and indirect emissions) from the action are fully offset within the same nonattainment or maintenance area. This may be accomplished through a revision to the applicable SIP or a similarly enforceable measure that effects emission reductions so that there is no net increase in emissions of that pollutant.
- Emissions do not exceed the emission budget – so that the total emissions (including direct and indirect emissions) from the action is determined and documented by the state agency primarily responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the nonattainment (or maintenance) area, would not exceed the emissions budgets specified in the applicable SIP.
- State governor's office presents assurance in the form of a SIP revision – so that the total emissions (including direct and indirect emissions) from the action is determined by the state agency primarily responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the nonattainment (or maintenance) area, would exceed an emissions budget specified in the applicable SIP. Under these conditions, the State Governor or the Governor's designee for SIP actions makes a written commitment to USEPA which includes:

  (1) A specific schedule for adoption and submittal of a revision to the SIP which would achieve the needed emission reductions prior to the time emissions from the federal action would occur;

  (2) Identification of specific measures for incorporation into the SIP which would result in a level of emissions which, together with all other emissions in the nonattainment or

maintenance area, would not exceed any emissions budget specified in the applicable SIP;

(3) A demonstration that all existing applicable SIP requirements are being implemented in the area for the pollutants affected by the federal action, and that local authority to implement additional requirements has been fully pursued;

(4) A determination that the responsible federal agencies have required all reasonable mitigation measures associated with their action; and

(5) Written documentation including all air quality analyses supporting the conformity determination.

2.6 Environmental Review Process

Depending on the scale of each LIS DMMP project, those projects with the potential to result in both local or regional air quality adverse impacts are typically required as part of the overall environmental resource impact study to undergo federal and/or state project-level environmental review processes.

2.6.1 The National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 requires the consideration of environmental issues in Federal agency planning and decision-making. The Council on Environmental Quality (CEQ) regulations, as contained in 40 Code of Federal Regulations (CFR) Parts 1500 to 1508, directs Federal agencies on how to implement the provisions of NEPA.

Under NEPA, federal agencies must prepare an environmental assessment (EA) or environmental impact statement (EIS) for any Federal action, except those actions that are determined to be “categorically excluded.” An EIS is prepared for those Federal actions that may significantly affect the quality of the human environment. A programmatic EIS for the LIS DMMP is currently being prepared by the USACE.

An EA is a concise public document that provides sufficient analysis for determining whether the potential environmental impacts of a proposed action are significant, resulting in the preparation of an EIS, or if not significant, resulting in the preparation of a Finding of No Significant Impact (FONSI). Thus, if the lead agency were to determine that the individual project under the LIS DMMP would have a significant impact on the quality of the human environment, an EIS would be prepared and a final Record of Decision (ROD) would be made by the lead agency on the proposed action after the completion of the EIS.

2.6.2 State Environmental Quality Review Process

2.6.2.1 New York

New York's State Environmental Quality Review Act (SEQR) requires all state and local government agencies to consider environmental impacts equally with social and economic factors during discretionary decision-making. This means state agencies must assess the environmental significance of all actions they have discretion to approve, fund, or directly undertake. SEQR requires the agencies to balance the environmental impacts with social and economic factors when deciding to approve or undertake an action.

If an action is determined not to have significant adverse environmental impacts, a determination of nonsignificance (negative declaration) is prepared. If an action is determined to have potentially significant adverse environmental impacts, an EIS is required.

The SEQR process uses the EIS to examine ways to avoid or reduce adverse environmental impacts related to a proposed action. This includes an analysis of all reasonable alternatives to the action. The SEQR "decision making process" encourages communication among government agencies, project sponsors and the general public. SEQR applies to all state or local government agencies including districts and special boards and authorities whenever they must approve or fund a privately or publicly sponsored action. It also applies whenever an agency directly undertakes an action. Applicants who seek project approval or government funding may be responsible for preparing an EA or EIS.

In the SEQR process, when actions consist of several steps or sets of activities, the entire set must be considered the action, even if several separate agencies are involved. Segmentation of an action into components for individual review is contrary to the intent of SEQR.

2.6.2.2 Connecticut

The Connecticut Environmental Policy Act (CEPA) establishes environmental policy for the state of Connecticut. It requires an Environmental Impact Evaluation (EIE) for any state action which could potentially impact the natural environment. The lead agency is responsible for preparing the EIE, which is reviewed and approved by the Office of Policy and Management once it is completed.

CEPA states that, with a few exceptions, the sponsoring state agency must prepare an EIE before undertaking any action that may have significant impacts on the environment. Like the Federal EIS, the EIE must include a range of alternatives along with the No Action option. The EIE must consider the impacts on each environmental resource, including air quality, for each alternative.

Once the lead agency has completed an EIE, it is made available for public review and comment for a 45 day period. Upon the expiration of the review and comment period, the lead agency issues a Record of Decision and the EIE is submitted to the State Office of Policy and Management (OPM) for final review of the evaluation's adequacy. If the EIE is found to be inadequate, the OPM will require an EIE supplement from the lead agency, or may reject it entirely if the EIE is seriously flawed.

2.6.2.3 Rhode Island

As described previously, the RIDEM submitted its SIP to the USEPA in 2008 to demonstrate attainment of O_3 NAAQS for the Providence nonattainment area. Rhode Island has the same emissions standards for non-road mobile sources and marine diesel engines as those promulgated by USEPA, and has applied these standards in generating the emissions inventory for the demonstration of reasonable further progress and attainment. The emission sources associated with the LIS DMMP projects would be subject to the EPA performance standards, and therefore, would be consistent with the SIP.

2.7 Regulations Applicable to LIS DMMP-Associated Projects

2.7.1 Federal Action

The CAAA GCR is applicable to any project-level action requiring federal funding and approval. The annual project-level air emissions (direct and indirect) potentially resulting from the LIS DMMP will be estimated using the most current planning tools and will be compared with the GCR-established *de minimis* levels to determine whether a formal SIP conformity determination is required. If the annual emissions levels are greater than the corresponding *de minimis* thresholds, a formal GCR determination should be considered according to the manner described in Chapter 4.4. Currently, the emission budgets in the SIP for non-road mobile sources do not account for major harbor dredging activities, such as those considered in the LIS DMMP, therefore, the most feasible solution among the four measures is to make a positive project-level GCR determination through a demonstration that:

- Emissions will be included in the future SIP; or
- Emission offsets are identified.

However, both methods require a substantial regulatory process and are difficult to achieve (e.g., identify available emissions credits for construction emissions offset purposes). In order to avoid the unnecessary lengthy regulatory process or difficulties, a reevaluation of potential overly conservative assumptions used for project-level emissions estimates should be conducted that would lead to more reasonable and realistic emissions forecasts. Other feasible annual emission reduction measures can be further considered as appropriate such as implementing alternative dredging methods, using cleaner equipment, modifying the project schedule, etc. to demonstrate that the annual project-level air emissions would not exceed the applicable *de minimis* levels for certain LIS DMMP alternatives.

2.7.2 Private Action

The GCR is not directly applicable to any project action carried through by a private entity, which is not under continuous federal agency responsibility or control. These project components would essentially be required to follow the applicable state environmental review process to determine if the project-level air emissions would have the potential to:

- Cause or contribute to new or existing violations of NAAQS in the area.
- Increase the frequency or severity of an existing NAAQS violation in the area.
- Delay timely attainment of NAAQS, or required interim emission reductions, or other milestones in any area.

Given the temporary nature of construction activity emissions, potential air quality impacts are often addressed qualitatively in NEPA and state environmental documents. However, for large-scale construction projects which may last many years at a local site, construction emissions impacts are often considered to be similar to operational emissions impacts under this condition. Accordingly, a more refined project-level air quality emissions and concentration modeling analysis may be warranted.

Project-level air quality impacts are generally evaluated on two scales:

- Microscale level for CO and $PM_{2.5}$: a microscale analysis (i.e., hot spot analysis) of mobile source-related impacts along mobile source traveling routes or at mobile source operation sites such as a dredging site or disposal site provides estimates of localized pollutant concentrations for direct comparison to the NAAQS. USEPA has published nonattainment area $PM_{2.5}$ hot spot analysis guideline, *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas* (USEPA 2010), that can be used to predict project-level air quality concentrations to make a direct comparison with NAAQS to satisfy both NEPA and state environmental review requirements.

- Mesoscale level for nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which are precursors of O_3. Ozone is a pollutant of regional concern in nonattainment areas and is subject to air transport phenomena under different weather conditions; therefore O_3-related impacts are generally evaluated on a regional basis by the appropriate regional metropolitan planning organization or MPO, through a regional emissions analysis. The regional emissions analysis is a part of the TIP and addresses the regional emission impacts from all projects that are included in the TIP. Once the TIP has been determined to conform to the SIP, the projects it includes do not require a regional emissions analysis on a project level, since their emissions are included in the TIP's emissions analysis. Therefore the project preferred alternative will exempt from regional emissions analysis if it is included in the conforming TIP.

Although the GCR is not directly applicable to a private project, using the federal approach in the same context, which compares project-level annual emissions levels with corresponding GCR *de minimis* levels, can be considered a useful tool to screen out those potential actions studied under the LIS DMMP that have minimal air quality impacts. Furthermore, using the emissions reduction approach (implementing alternative dredging methods, using cleaner equipment, modifying project schedule, etc.) as defined previously for a federal action, can further reduce the number of projects that would not be *de minimis* on air emissions for a specific nonattainment pollutant.

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3 Air Emissions Analysis Methodology

3.1 Activity Data Development

In order to predict the air emissions from activities associated with the LIS DMMP various scenarios were developed and models were run. These activity resource data were used to predict emissions and cost estimates for dredging projects in the Long Island Sound.

3.1.1 Development of Dredging Scenarios

The USACE New England District developed various dredging scenarios to be evaluated as summarized in the task's Scope of Work. The dredging scenarios include estimates of equipment sizes (type and horsepower) and operating hours required for the dredging and disposal, including transportation and processing as appropriate and mobilization and demobilization. Consequently, emissions for the execution of the work itself are based directly on these estimates. The formulas described in the following sections were used to calculate equipment operating requirements to provide emissions estimates for the various scenarios.

To streamline the emissions estimation process, the equipment requirements were sorted into "modules" according to the key variables that drive the equipment selection and operating time (e.g., project size, pumping distance, etc.). Modules include dredge method, disposal method, and the distance and method of transport for disposal, among other parameters. The respective options are identified for each key variable and equipment requirements are identified on a scalable (typically, per unit volume of dredged material) basis. The various options can then be combined to determine the emissions from the various scenarios developed by USACE. These models are intended for use by individuals familiar with the practical aspects of dredging projects and who would therefore make informed decisions as to equipment selection, disposal method and transportation that are consistent with the project being estimated.

The basic dredging technologies considered are mechanical dredging by bucket and hopper dredges, and hydraulic pipeline cutterhead dredges.

3.1.1.1 Mechanical Dredges

The equipment associated with mechanical dredging includes a workboat, the dredge plant itself, a tug for general support and a mobilization and demobilization (M&D) tug. Productivity of a bucket dredge is driven primarily by the bucket size and secondarily by the mechanical power necessary to move that bucket. The larger the bucket, the more material that may be removed per bite, but the dredge power plant must also be larger. Bucket size is optimized to reflect site conditions, which may include (among factors) total depth of dredging, total quantity of dredging, and material type. Supporting equipment is directly tied to this decision, and therefore bucket size is considered the only driving variable for establishing dredge operational time.

Based on USACE-provided data, 10-cubic yards (CY) buckets are paired with 1,295-horsepower (HP) dredges, 26-CY buckets are paired with 9,830 HP dredges and 54 CY buckets are paired with 10,220 HP dredges as summarized in Table 3-1. A 100-HP workboat is required for the same duration as the dredge, corresponding to project size. A 3,300 HP M&D tug is required for times varying from 90 to 150 hrs, depending on disposal distance and disposal type, but does not appear to vary with project size. 110 hours represents the M&D tug requirement equal to or exceeding that required in 80 percent of the scenarios;

therefore, it is assumed that the M&D tug is required for 110 hours per job for mechanical dredge mobilizations. A 100-HP workboat is also required for the same operating hours as the dredge. Mechanical dredge module assumptions are summarized in Table 3-1.

Table 3-1
Mechanical Dredge Modules

Equipment	Hours per 1,000 CY dredged
1,295 HP dredge w/ 10 CY bucket	9
9,830 HP dredge w/ 26 CY bucket	5
10,220 HP dredge w/ 54 CY bucket	3.3
100 HP workboat	Same as dredge
3,300 HP M&D tug	110 hours per project
Emissions location: dredging site	

3.1.1.2 Hydraulic Cutterhead Dredges

The equipment associated with hydraulic dredging includes a workboat, the dredge plant itself, a tug and an M&D tug. Booster pumps may also be required, but depend on the pumping distance as a primary variable and are therefore considered as a separate module. Productivity of a hydraulic dredge is driven primarily by horsepower; the larger the horsepower, the more material that may be removed per hour. In practice suction line diameter is a consideration – too small or large a diameter, and the dredge does not operate effectively. Based on review of the aggregated data from the Corps, however, while four diameters were nominally considered (12-, 16-, 24- and 30-inch), only for the two smaller diameters were different suction line sizes considered for the same horsepower dredge, and the productivity variations could be considered negligible. In addition, since suction line diameter would typically increase with horsepower anyway, diameter (for an estimate such as this) can reasonably be considered at most a secondary variable, and is therefore not considered further in establishing equipment requirements for emissions calculations.

Occasional substantial deviations in correlations between horsepower and productivity appear to be outliers based on review of overall trends. There, is however, an observed break in the productivity trend observed for 1,000 and 2,000 CY projects with a 2,035 HP dredge as compared to projects of 5,000 CY or more. Accordingly, different productivity rates for small projects are identified in the module. The aggregated data for tug utilization for hydraulic dredges indicates that a 3,300 HP tug is generally required for half of the operating hours of the dredge. Finally similar to the mechanical dredge, a 100-HP workboat is required for the same operating hours as the dredge. Hydraulic dredge module assumptionss are summarized in Table 3-2.

Table 3-2
Hydraulic Cutterhead Dredge Modules

Equipment	Hours per 1,000 CY dredged
2,035 HP dredge (projects less than 5,000 CY)	6.6
2,035 HP dredge (projects of 5,000 CY or more)	4.5
3,625 HP dredge	2.9
9,620 HP dredge	1.8
19,230 HP dredge	0.9
3,300 HP tug	One-half of the dredge operating hours
100 HP workboat	Same as dredge
3,300 HP M&D tug	80 hours per project
M&D dredge	80 hours per project
Emissions location: dredging site	

3.1.1.3 Hopper Dredges

The equipment associated with dredging by hopper in the aggregated data includes a workboat, the dredge plant itself, a tug and M&D of the dredge. The aggregated hours for some pieces of this equipment account for the dredging itself as well as transport and disposal, which vary based on distance and type of disposal. For the purposes of the dredging work only, only the M&D of the dredge as well as equipment hours for the workboat and dredge plant that do not vary based on disposal distance or type were considered. The portion of those equipment hours that do vary based on distance or type of disposal site are separated and considered in the transport modules. For M&D of the dredge, either 80 or 100 hours were identified in the data; for conservatism, 100 hours was used for all scenarios to eliminate an additional variable. Hopper dredge module assumptions are summarized in Table 3-3.

Table 3-3
Hopper Dredge Modules

Equipment	Hours per 1,000 CY Dredged
4,125 HP hopper dredge	2.0
4,125 HP pump-off hopper dredge	2.3
11,085 HP hopper dredge	0.9
11,085 HP pump-off hopper dredge	1.6
18,000 HP hopper dredge	0.4
18,000 HP pump-off hopper dredge	0.7
100 HP workboat	Same as dredge
3,300 HP tug	One-half of the dredge operating hours
M&D of dredge	100 hours per project
Emissions location: dredging site	

3.1.2 Transport

The equipment associated with transport of dredged material may include tugs, trucks, railroad locomotives and booster pumps, depending on the dredging method and ultimate disposal location. The assumptions for the scow, hopper, and transport are detailed below.

3.1.2.1 Tug-Hauled Scow

The assumptions underlying the data provided by USACE varied from case to case, such as the size of the scows. The aggregated data was adjusted to reflect a common assumption of total transport hours minus the dump scow operating hours (which are dependent on the project size only, independent of the distance to the disposal site), divided by the number of scow-miles actually required for transport. The resulting coefficients varied greatly, but based on review of the data a value of 0.75 is considered the most appropriate coefficient. Assumptions for tug-hauled scow transport are summarized in Table 3-4.

Table 3-4
Tug-Hauled Scow Transport

Equipment	Hours
3,300 HP tug (transport only)	0.75 * (project size / scow size)* disposal distance (miles)
170 HP crane & bucket (offload for non-open dump projects)	Project size / 300
Notes: Emissions location: allocate tug proportionally along transport route. *For project and scow sizes, use actual size in CY (not thousands of CY in KCY).	

3.1.2.2 Hopper Dredge Transport

The assumptions underlying the data provided by USACE varied, but in general approximately 0.46 hours are required per scow-mile traveled for transport to open-water disposal locations in hopper dredges, plus one hour per load for dumping. In addition, pump-off hoppers also require the use of pumps to offload dredged material, which does not vary The aggregated data is inconsistent regarding the use of pumps for offloading of pump-off hoppers, for example they are not shown for projects exceeding 100 thousand CY [KCY]. The pump operating time mirrors the total dredge operating time (inclusive of transport), although pump-off time would be a function of the project size only and not the transport distance. To provide a conservative estimate, it is assumed that the pump is nevertheless required for the same total operating time as the dredge (dredging plus transport time). Assumptions used for hopper dredge transport are summarized in Table 3-5.

Table 3-5
Hopper Dredge Transport

Equipment	Hours
Hopper dredge (same as used for dredging module)	0.46 * (project size / hopper size) * disposal distance (miles)
700 HP pump (offload for pump-off hoppers only, regardless of disposal option)	Same as dredge (total of dredging module and transport module hours)
Notes: Emissions location: allocate proportionally along transport route. *For project and hopper sizes, use actual size in CY (not in KCY).	

3.1.2.3 Truck Transport

For truck transport to upland disposal or rail transloading sites, it was generically assumed that a 400-HP truck would be used. In most cases, a 20-CY truck capacity was assumed, although this should be reduced when required due to weight or length restriction on transport or at the disposal site. Total truck mileage is therefore the total project volume divided by 20, and multiplied by the round-trip distance to the selected facility (upland site or transloading location). Assumptions used for truck-hauled transport are summarized in Table 3-6.

Table 3-6
Truck-Hauled Transport

Equipment	Mileage
400 HP truck	Total volume (CY) / truck capacity (CY) * round-trip distance (miles)
Notes: Emissions location: allocate proportionally along transport route. Adjust half of loads as empty and half fully loaded for emission factors. Split of highway/arterial factors is site-specific.	

3.1.2.4 Railroad Transport

Based on data provided by USACE for a 2,500-HP railroad locomotive transporting dredged material the unit transport time ranges from 20 hours per 1,000 CY for the smallest (1,000 CY) project size to 2.08 hours per CY for all project sizes from 50,000 CY and up. Assumptions used for railroad-hauled transport are summarized in Table 3-7.

Table 3-7
Railroad-Hauled Transport

Equipment	Hours per 1,000 CY Dredged
2,500 HP Railroad Locomotive	
1 KCY projects	20
2 KCY projects	10
5 - 26 KCY projects	4

Equipment	Hours per 1,000 CY Dredged
>=50 KCY projects	2.08
Rail Hopper Dump 100 HP	
1 KCY projects	15
2 KCY projects	7.5
5 - 26 KCY projects	3
>=50 KCY projects	2.5
Notes: Emissions location: allocate locomotive proportionally along transport route and rail hopper dump at destination. Assuming rail is not available at the dewatering site, also include trucking mileage for trans-loading using the truck-haul module.	

3.1.2.5 Pipeline Transport

By necessity, booster pump operation for pipeline transport equals the operational uptime of the dredge itself. The distance to the dewatering location (end point for hydraulic pipelines) is generally between 0 and 2 miles for all scenarios. The aggregated data is inconsistent regarding number of booster pumps or application (e.g., they are not shown for projects exceeding 1 million CY [MCY]). To provide a conservative estimate, it was assumed that a minimum of 1 booster pump would be required for all pipeline operations. In most cases, truck or rail transport of dredged material will also be needed for dewatered material; these equipment hours should be added using the appropriate module (Tables 3-6 and 3-7). Assumptions used for pipeline transport are summarized in Table 3-8.

Table 3-8
Pipeline Transport

Equipment	Hours per 1,000 CY Dredged per Mile
700 HP booster pump	Same as dredge
Notes: Emissions location: site of dredging	

3.1.3 Disposal/Dewatering Site Activities

Depending on the specific type of disposal site, the equipment associated with disposal and dewatering site activities may include loaders, dozers, cranes and buckets, booster pumps, and dump scows.

3.1.3.1 Open Water Disposal

Equipment operating hours for open-water disposal options are directly related to the size of the project and the size and type of the transport vessel. Based on the aggregated data, the operating time per dump is constant. Assumptions used for open water disposal are summarized in Table 3-9.

Table 3-9
Open Water Disposal – Scows and Hoppers

Equipment	Hours per 1,000 CY Dredged
Dump Scows	
250 HP Dump Scow Engine	0.46 hour * total volume / scow size
3,300 HP tug (during dump time only)	0.46 hour * total volume / scow size
Hopper Dredges	
Hopper dredge (same as used for dredging module)	1 hour * (project size / hopper size)
Notes: Emissions location: at disposal site.	

3.1.3.2 Beach Nourishment

Equipment required for beach nourishment includes loaders, dozers and trucks. Based on the aggregated data, the equipment hours required for both a dozer and loader are 10 hours per 1 KCY dredged for projects less than 250 KCY, and 6 hours for projects of 250 KCY or greater. In addition, a 400 HP truck is required for 5 hours per 1 KCY dredged for projects up to 75 KCY, and required for 7.5 hours per 1 KCY dredged for projects of 100 KCY or more. Assumptions used for beach nourishment are summarized in Table 3-10.

Table 3-10
Beach Nourishment

Equipment	Hours per 1,000 CY Dredged
250 HP Loader & 200 HP Dozer	
Projects less than 250 KCY	10
Projects 250 KCY or more	6
400 HP Truck	
Projects less than 500 KCY	5
Projects 500 KCY or more	7.5
Notes: Emissions location: beach nourishment site. Pipeline transport for one mile should be added if dredging technology is hopper dredge (direct placement for hydraulic dredging	

3.1.3.3 Containment Island

Equipment required for containment island disposal includes loaders, dozers and trucks. Based on the aggregated data, the equipment hours required for both a dozer and loader are 20 hours per 1 KCY dredged for projects less than 250 KCY, and 12 hours for projects of 250 KCY or greater. In addition, a 400 HP truck is required for 15 hours per 1 KCY dredged for projects up to 250 KCY, and 9 hours per 1 KCY dredged for projects of 250 KCY or more. Assumptions used for containment island disposal are summarized in Table 3-11.

Table 3-11
Containment Island Disposal

Equipment	Hours per 1,000 CY dredged
250 HP Loader & 200 HP Dozer	
Projects less than 250 KCY	20
Projects 250 KCY or more	12
400 HP Truck	
Projects less than 250 KCY	15
Projects 250 KCY or more	9
Notes: Emissions location: Containment Island site.	

3.1.3.4 Confined Aquatic Disposal (CAD) Cells

CAD cell disposal construction is equivalent to the dredging and open water disposal of the volume of material necessary to accommodate the targeted dredge material. Dredging and open water disposal of 1.4375 times the volume of target material is needed in order to create the CAD cell itself (25% bulking factor plus 3 feet of capping material and freeboard). For the purposes of this module, the operating hours to construct the CAD cell were developed using the production rates established for mechanical dredging (Section 3.1.1.1). This is assumed to be a more accurate and defensible approach than attempting to isolate the target dredging and CAD cell dredging from within the total equipment hours provided in the aggregated data. The dredging of the target material itself is not included in this module, and must be estimated using the appropriate module. Assumptions used for CAD cell disposal are summarized in Table 3-12.

Table 3-12
CAD Cell Mechanical Dredge Disposal

Equipment	Hours per 1,000 CY Dredged
Creation of CAD Cell	
1,295 HP dredge w/ 10 CY bucket	13
9,830 HP dredge w/ 26 CY bucket	7.2
10,220 HP dredge w/ 54 CY bucket	4.7
100 HP workboat	Same as dredge
3,300 HP tug (transport and dumping)	0.75 * (1.4375 * Project size / scow size) * CAD material disposal distance + 0.46 hours * 1.4375 * project size / scow size
250 HP Dump Scow Engine	0.46 hours * 1.4375 * project size / scow size

Equipment	Hours per 1,000 CY Dredged
Placement of Targeted Material at CAD Cell	
3,300 HP tug (transport and dumping)	0.75 * (Project size / scow size) * project disposal distance + 0.46 hours * project size / scow size
250 HP Dump Scow Engine	0.46 hours * total volume / scow size
Emissions Locations For CAD cell dredging and placement of targeted material: site of CAD cell. For transport and dumping of CAD cell material: allocate tug proportionally along transport route. "CAD material disposal distance" refers to the travel distance from the site of the CAD cell to the location at which material excavated to form the CAD is to be disposed. "Project disposal distance" refers to the distance from the targeted dredging location to the CAD cell.	

3.1.3.5 Marsh Creation Site

Equipment required for a marsh creation site includes loaders, dozers and trucks. Based on the aggregated data, the equipment hours required are constant on a unit-dredged basis, with a decrease in the number of hours needed for loaders and dozers at 250 KCY and for trucks at 50 KCY. Assumptions used for marsh creation are summarized in Table 3-13.

Table 3-13
Marsh Creation

Equipment	Hours per 1,000 CY Dredged
250 HP Loader & 200 HP Dozer	
Projects less than 250 KCY	15
Projects 250 KCY or more	9
400 HP Truck	
Projects less than 50 KCY	10
Projects 50 KCY or more	6
Notes: Emissions location: marsh creation site.	

3.1.3.6 Upland Dewatering Site

Equipment required for an upland dewatering site includes loaders, dozers and trucks. Based on the aggregated data, the equipment hours required are constant on a unit-dredged basis, with decrease in the number of hours needed for loaders and dozers at 250 KCY and for trucks at 50 KCY.. The use of trucks is not consistently identified in the aggregated data for project sizes over 250 KCY, but it is included in enough scenarios of these larger project sizes to establish the trend in operating hours. It is assumed that the trucking component should be included for all scenarios. Assumptions used for upland dewatering are summarized in Table 3-14.

Table 3-14
Upland Dewatering

Equipment	Hours per 1,000 CY dredged
250 HP Loader & 200 HP Dozer	
Projects less than 250 KCY	15
Projects 250 KCY or more	9
400 HP Pruck	
Projects less than 50 KCY	10
Projects 50 KCY or more	6
Notes: Emissions location: dewatering site.	

3.1.4 Commuter Vehicles

In practice, dredging operations employ shifts from 8 to 12 hours in length, depending on site access and local labor conditions. It is assumed that a round-trip of a site worker in a passenger vehicle is required for every 10 hours of total equipment operations, on average.

3.2 Emission Factor Modeling

3.2.1 Nonroad Equipment

Estimates of the operational emissions from nonroad dredging and dredged material disposal equipment were developed based on the estimated hours of equipment use as described previously and the emission factors for each type of equipment. Criteria emission factors were taken from USEPA's NONROAD emission factor model (USEPA 2009a) for Tier 2 engines associated with the national default model database for nonroad engines. This approach is considered conservative since currently Tier III and IV cleaner engines have been widely implemented in large scale projects. All equipment was assumed to be diesel-powered.

The USEPA recommends the following formula to calculate hourly emissions from nonroad engine sources including cranes, front end loaders, and other machines:

$$M_i = N \times HP \times LF \times EF_i$$

where:

M_i = mass of emissions of i^{th} pollutants during inventory period;
N = source population (units);
HP = average rated horsepower;
LF = typical load factor; and
EF_i = average emissions of i^{th} pollutant per unit of use (e.g., grams per horsepower-hour).

3.2.2 Trucks and Commuter Vehicles

USEPA's Motor Vehicle Emission Simulator (MOVES) software was used to predict truck and commuter vehicle running emission factors for all criteria pollutants and CO_2. Because these vehicles can originate from and travel through various counties among several states, the emissions factors from these vehicles were modeled by selecting inputs available in the model established for several default representative counties for each affected state based on the proximity to dredging sites. The selected representative counties for each affected state include:

- New York: Nassau
- Connecticut: New Haven
- Rhode Island: Newport
- New Jersey: Hudson
- Pennsylvania: Allegheny

These emissions factors were then multiplied by the estimated truck and commuting vehicle operating hours forecasted to determined the project-associated on-road vehicle indirect emissions.

3.2.3 Tugs

Tugs emissions were calculated using the methodologies that are essentially the same as those used for nonroad equipment discussed previously. Emission factors, load factors, and power values related to diesel engines were taken from *Current Methodologies in Preparing Mobile Source Port-related Emission Inventories* (USEPA 2009b).

3.2.4 Locomotives

Locomotive emissions were calculated using estimated running hours and size described in Section 2 and the emission factors for Tier II locomotive engines obtained from *Emission Factors for Locomotives* (USEPA 2009c).

3.3 Emissions Workbook

A comprehensive emissions workbook was developed as part of the efforts described in this report to predict project-specific emissions by incorporating: 1) activity input data primarily established by the USACE and 2) source-specific emissions factors and load factors established by using USEPA-developed modeling tool and guideline documents. A brief user’s guide for this workbook can be found in Chapter 5.

3.4 Compliance Measures

Air quality is defined by ambient air concentrations of specific pollutants of concerns. Project level impacts can be predicted by a direct comparison with the NAAQS through a refined concentration modeling analysis. Nonetheless, the GCR provides a measure to screen out those projects with minimal air quality concerns in terms of project-level annual emissions levels. If the project-generated annual emission level is below the *de minimis* threshold for a specific nonattainment/maintenance pollutant, the project is presumed to have minimal air quality impact for that pollutant. This emission-based comparison is a much simpler approach and is particularly useful for a programmatic action that lacks specific design information for an individual project at an early planning stage. Although the GCR applies to federal actions, this approach can be used in the same context to screen a private program/project. The project would be unlikely to have significant air quality concerns if the project-generated annual emissions are below the GCR *de minimis* levels.

This report uses the GCR *de minimis* levels as the thresholds to determine whether the project would have potential significant impacts. It should be noted that exceedances of the GCR *de minimis* levels are only the indicators of potential air quality concerns and the project warrants a formal conformity determination to further assess its impact significance.

Therefore the GCR *de minimis* levels are selected here for identifying those projects that are deemed to be in compliance with the SIPs. For those projects with potential exceedances of the GCR *de minimis* levels, a formal determination will be required including implementing those options identified in Section 2.5 including emissions offsets.

3.5 Potential Mitigation Measures

If direct and/or indirect emissions exceed the *de minimis* threshold for a specific nonattainment pollutant as a result of a project, a formal conformity determination is required through more refined air quality impact analyses for localized pollutants, such as PM and CO. For regional pollutants, such as NOx or VOC, one of the four options identified in Section 2.5 could be selected. However, the commonly used alternative mitigation options in addressing project-level potential air quality concerns applicable to the LIS DMMP could include:

1) Source control: reducing emissions to the levels that are below the *de minimis* thresholds by committing to the use of cleaner equipment during the process, such as using Tier III and/or Tier IV engines.

2) Schedule modification: extending dredging and disposal schedule to reduce emissions levels below the *de minimis* thresholds on an annual basis.

3) Emissions offsets: retiring the same amount of emissions generated by the project through purchasing available emissions credits.

4 DDMP Cost

4.1 Dredged Material Disposal Cost

Cost data for key components of the dredging work was provided by the USACE in the form of total and unit prices (where applicable) for major components of the work (e.g., dredging, dewatering, disposal, etc.). The prices were all-inclusive and did not break out the portions of the cost attributable to individual factors such as fuel cost, labor cost and equipment costs. Therefore, for the purposes of the model all costs were used directly. A fuel cost of $4.20 per gallon was used for all cost data provided by the USACE. The cost computation modules are summarized for mechanical dredging, hydraulic dredging, hopper dredging, and additional dredging costs in Tables 4-1 through 4-4, respectively. These numbers may be revised if detailed cost breakdown information becomes available in the future.

Table 4-1
Mechanical Dredging Costs

Mobilization Costs	
Dredge (10 CY bucket) and one 1/1.5/3 KCY scow	$130,000
Dredge (26 CY bucket) and one 1/1.5/3 KCY scow	$177,000
Dredge (54 CY bucket) and one 6KCY scow	$229,000
Each additional 1/1.5/3 KCY scow and tug	$117,500
Each additional 6 KCY scow and tug	$183,500
Dredging Costs per CY	
10 CY bucket, 1 KCY job	$45
10 CY bucket, 2 KCY job	$31
10 CY bucket, 5 -10 KCY job	$17.25
10 CY bucket, 26 – 50 KCY job	$14.25
10 CY bucket, >=100 KCY job	$13.50
26 CY bucket	$23.35
54 CY bucket	$20.40
Scow Transport Costs per CY per Mile Travelled (total, round-trip to disposal or transload point)	
1/1.5 KCY scows	$0.155
6 KCY scows	$0.110

Table 4-2
Hydraulic Dredging Costs

Mobilization Costs	
Dredge (12 in cutter)	$390,000
Dredge (16 in cutter)	$410,000
Dredge (24 in cutter)	$520,000
Dredge (30 in cutter)	$550,000
Each booster pump	$10,000
Each tug	$10,000
Dredging and Pumping Costs per CY	
Dredge (12 in cutter), 1 & 2 KCY jobs	$32.50
Dredge (12 in cutter), 5 & 10 KCY jobs	$17.00
Dredge (12 in cutter), >=26 KCY jobs	$14.50
Dredge (16 in cutter)	$10.00
Dredge (24 in cutter)	$9.03
Dredge (30 in cutter)	$6.28

Table 4-3
Hopper Dredging Costs

Mobilization Costs	
1,300 CY Dump Hopper	$340,000
3,800 CY Dump Hopper	$590,000
7,600 CY Dump Hopper	$1,032,000
1,300 CY Pump Hopper (Beach Nourishment)	$550,000
3,800 CY Pump Hopper (Beach Nourishment)	$1,05,000
7,600 CY Pump Hopper (Beach Nourishment)	$1,372,000
12- or 16-in Pump Hopper (Cont. Island)	$640,000
Dredging Costs per CY	
1,300 CY Dump Hopper	$8.80
3,800 CY Dump Hopper	$6.89
7,600 CY Dump Hopper	$5.59
1,300 CY Pump Hopper (Beach Nourishment)	$28.50
3,800 CY Pump Hopper (Beach Nourishment)	$14.25
7,600 CY Pump Hopper (Beach Nourishment)	$12.00
12- or 16-in Pump Hopper (Cont. Island)	$14.20 (1, 2 or 5 KCY jobs) $12.60 (10 to 750 KCY jobs) $5.73 (1 MCY and larger jobs)
Transport Costs per CY per Mile Travelled (total, round-trip to disposal)	
1,300 CY Dump Hopper	$0.81
3,800 CY Dump Hopper	$0.40
7,600 CY Dump Hopper	$0.35
1,300 CY Pump Hopper (Beach Nourishment)	$0.40
3,800 CY Pump Hopper (Beach Nourishment)	$0.40
7,600 CY Pump Hopper (Beach Nourishment)	$0.35
12- or 16-in Pump Hopper (Cont. Island)	$1.50 (1 to 250 KCY jobs)

	$0.46 (500 KCY and larger jobs)

Table 4-4
Additional Dredging-Related Costs

Type	Cost Index
Beach Nourishment	$3/CY
Containment Island Tipping Cost	$76/CY
Containment Island Monitoring Cost	$3,000/yr for 20 yrs ($60,000 total)
Rehandling into Dewatering Area	$3/CY
Dewatering Site Prep	$3/CY
Dewatering Site Operation & Closure	$3/CY
CAD Cell Dredge, Disposal & Capping	$40.50/CY (up to 26 KCY) $36.30/CY (50 KCY and larger)
Upland Site Tipping Fee	$10/CY
Trucking Fees	($6.15 plus $0.35/mi – round trip) per CY
RR Haulage to Upland Site in PA	$101.25/CY + $29.80/CY second rehandling charge
Manage & Monitor Upland Site	$20,000/yr for 5 yrs ($100,000 total)
Manage & CAD Site	$5,000/yr for 12 yrs ($60,000 total)

4.2 Emission Offsets Cost

The cost of emissions offsets is market-driven. Emission Reduction Credit (ERC) trading is authorized by regulations primarily for the construction of new large stationary sources of air pollution known as New Source Review (NSR) rules. The principles behind the NSR rules are designed to permit new economic development in areas where air quality does not meet NAAQS. Since the air quality condition in the project area is already poor, the government would not allow new pollution resulting from a new facility or expansion of an existing major facility in these areas.

Both federal and state NSR rules require a new source that is a major source of air pollutants to: obtain a construction permit; install Best Available Control Technology (BACT) air pollution controls at the new source; conduct an alternatives analysis; and reduce total emissions of pollutants in the area by offsetting or reducing pollution from another source at that facility or from other facilities in the area. The purpose of the ERC trading program is to establish a bank of emission offsets that can be used to allow construction of new sources. The NSR offset rules create a market for ERCs that will be necessary for future industrial development. Although the ERC trading program is designed for stationary sources, using available stationary source ERCs to offset construction project-related emissions has been approved in the past by state agencies on a case-by-case basis. The federal NSR rules create an offset requirement, but there are no federal rules on ERC generation. Each state has its own emission offsets rules.

The program for trading ERCs is a combination of command and control regulation and free market mechanisms. Therefore, the cost of purchasing ERCs varies over time mainly due to market demand and supply. The supply conditions are also impacted by the state rule on the ERCs life time allowance.

The market unit prices shown and used in the emissions workbook are based on the average trading prices in 2013 provided by Evolution Markets, an ERC brokerage company. These state-specific ERC unit costs for purchasing credits were multiplied to the total emissions, if they exceed the *de minimis* thresholds, to determine the likely emission offset cost for each applicable nonattainment pollutant.

5 Brief Emissions and Cost Workbook User's Guide

5.1 Overview

This workbook measures emissions, costs, and offset emissions and costs due to dredging related activities in the Long Island Sound. All calculations are based on data from the USACE, which provided equipment data, operating hours and costs for more than 530 different dredging scenarios utilizing various combinations of project size, dredging technology and disposal options. Equipment operation profiles and cost data were extracted from the consolidated data and used to develop trend data that forms the basis of this workbook.

The workbook is organized such that the user provides input as described below in a linear fashion on the "Main Inputs," "Dredged Material Disposal [DMD] Cost Inputs," and "Emi Offset Inputs" tabs. The workbook then calculates emissions and costs, and results are provided to the user on several tabs. The "Total Emissions" tab presents the emissions of the regulated pollutants (VOCs, NOx, CO and $PM_{2.5}$) by state, broken down by the various stages of the project (i.e., dredging, transportation, dewatering, etc.), and alerts the user as to areas where the proposed project may exceed *de minimis* levels. The state-by-state breakdown is calculated using the location-specific data provided by the user. Consequently, selection of accurate locations for project-related emissions on the "Main Inputs" tab is essential to the results presented on the "Total Emissions" tab. Costs are presented on the "Total DMD Costs" tab, broken down according to major cost accounting categories included in the USACE data. These include mobilization, dredging, transport, and disposal costs. The "Emi Offsets" tab presents the results of the emissions offset calculations, including a breakdown of emissions by conformity region, and the corresponding offset costs.

The following sections describe the required inputs. For most entries, the user will select from a drop-down menu that presents allowable inputs for that item. Such inputs areas are highlighted in orange. Some items permit free-form numerical input because the required information is specific to the proposed project (e.g., travel distance between the dredging site and the disposal location); these items are highlighted in blue.

The workbook requires that the user proceeds linearly through the data input process on the "Main Inputs" tab, as some of the required inputs are conditional and depend on prior user selections. For example, the available sizes of the dredging plant depend on the dredging method selected (e.g., for mechanical dredge projects the equipment is sized by cubic yard of the clamshell bucket, while for hydraulic cutterhead projects the diameter of the intake line is selected). The workbook changes dynamically to present only relevant questions to the user. If the user changes a selection that impacts subsequent data entries, the affected inputs will be highlighted in red. However, the user is nevertheless urged to review all inputs after changing a selection in order to confirm that the selections are still reasonable in light of the changes.

The primary data entry location is the "Main Inputs" tab, where the user defines the parameters of the proposed project. These include selecting a dredging technology, project size, equipment size, dredged material disposal location, transportation method and schedule. Additional user input to allow calculation of additional specific items is included on the "DMD Cost Inputs" and "Emi Offsets Inputs" tabs; users are directed to enter information on these tabs only when specific additional output is required, as described further below.

5.2 Main Inputs

The main inputs are emissions, costs, and offsets. These are calculated based on the following activities:

- Dredging
- Dewatering
- Transport to dewatering
- Disposal
- Transport to disposal

5.3 Itemized Inputs

For each activity, certain itemized inputs are needed to calculate its impacts. A summary of the required inputs, and allowable values, are outlined below:

5.3.1 Dredging

- DMD Activity Length (months)
- Dredging Location
  - New York
  - Connecticut
  - Rhode Island
- Dredging Equipment Type
  - Mechanical dredge
  - Hopper dredge
  - Hydraulic pipeline (cutterhead) dredge

For each dredging equipment type there are different dredge sizes to choose from:

- Mechanical dredge
  - Bucket size (CY)
    - 10 CY
    - 26 CY
    - 54 CY
- Hopper dredge
  - Dredge size (CY)
    - 1,300 CY
    - 3,800 CY
    - 7,600 CY

- Hydraulic pipeline (cutterhead) dredge
  - Dredge size (in)
    - 12 in
    - 16 in
    - 24 in
    - 30 in

- Volume of dredged material (CY)
  - 1,000 CY
  - 2,000 CY
  - 5,000 CY
  - 10,000 CY
  - 26,000 CY
  - 50,000 CY
  - 75,000 CY
  - 100,000 CY
  - 250,000 CY
  - 500,000 CY
  - 1,000,000 CY
  - 2,000,000 CY
  - 4,000,000 CY

5.3.2 Disposal

- Disposal Methods
  - Upland
  - Beach Nourishment
  - Containment Island
  - CAD Cell
  - Open Water
  - Marsh Creation

For each disposal method there are various location types that can be used:

- Upland Disposal Location
  - New York
  - Connecticut
  - Rhode Island

  - New Jersey
  - Pennsylvania

- Beach Nourishment
  - Same as dredging location

- Containment Island / CAD Cell
  - Niantic, CT
  - Clinton, CT
  - New Haven, CT
  - Stratford, CT
  - Fairfield, CT
  - Huntington, NY

- Open Water
  - Western Long Island Sound
  - Central Long Island Sound
  - New London, CT
  - Cornfield Shoals Disposal Site
  - Rhode Island Sound Disposal Site

- Marsh Creation
  - This depends on dredging location
    - New York
    - Connecticut
    - Rhode Island

If CAD Cell is chosen as the disposal method then the following needs to be chosen:

- CAD Cell Dredge Size
  - 1,295 HP Dredge w/ 10 CY bucket
  - 9,830 HP Dredge w/ 26 CY bucket
  - 10,220 HP Dredge w/ 54 CY bucket

5.3.3 Transport to Disposal

Transport to Disposal Method (allowable options vary based on disposal method):

- Upland
  - Truck
  - Railway
- Beach Nourishment
  - Pipeline
  - Hopper dredge (if hopper dredge, dredging equipment is used)
- Containment Island
  - Tug-hauled scow
  - Pipeline
  - Hopper Dredge (if hopper dredge, dredging equipment is used)
- CAD Cell
  - Tug-hauled scow
  - Hopper dredge (if hopper dredge, dredging equipment is used)
- Open Water
  - Tug-hauled scow
  - Hopper dredge (if hopper dredge, dredging equipment is used)
- Marsh Creation
  - Tug-hauled scow
  - Hopper dredge (if hopper dredge, dredging equipment is used)

Transport distances are to be determined by the user based on the dredging projects' proximity to disposal and transloading sites:

- Distance to containment island (mi) (Travel distance over water; user should consider the navigability of the selected path)
- Distance to CAD cell (mi) (Travel distance over water; user should consider the navigability of the selected path)
- Distance to open water (mi) (Travel distance over water; user should consider the navigability of the selected path)
- Truck/Rail transport mileage per state for upland disposal (mi) (from transloading/dewatering site to the disposal facility; over water transport distance to bring dredged material to shore will be addressed below)
  - Enter the mileage that trucks or rail will travel through each of the following states (actual roadway or railway distance; navigation software can be used to determine actual mileage):

  - New York
  - Connecticut
  - Rhode Island
  - New Jersey
  - Pennsylvania

Capacity or size of transportation vessel (with vessel type selected depending on the type of disposal method chosen:

- Tug-hauled scow size (CY)
- Hopper dredge size (CY)
- Truck capacity (CY)

Enter the destination of railroad-hauled dredge material if railway is chosen as the transport to disposal method

- New York
- New Jersey
- Pennsylvania

5.3.4 Additional Upland Disposal Inputs

If upland disposal is chosen as the disposal method, dewatering emissions and costs will be calculated.

<u>Dewatering</u>

- Location of upland dewatering
  - New York
  - Connecticut
  - Rhode Island

<u>Transport to Dewatering</u>

- Transport to dewatering method
  - Hopper dredge (if hopper dredge, dredging equipment is used)
  - Tug-hauled Scow
  - Pipeline
- Enter the distance from dredging to dewatering site (mi) (for hopper dredge or tug-hauled scow, the user should consider the navigability of the selected path; for pipeline, the user should consider the feasibility of constructing and maintaining the pipeline along the selected path)

5.4 DMD Cost Inputs

Calculations for costs mostly utilize the inputs from the Main Inputs tab. However, costs for additional equipment that may increase overall productivity or account for site-specific issues are not considered in this section. Generally, additional equipment options in this workbook are limited to additional tugs and booster pumps for hydraulic cutterhead projects, if warranted by site conditions (navigation issues, elevation changes, excessive distance and/or excessive pipeline direction changes, etc.). If hydraulic pipeline (cutterhead) dredge is chosen as the dredging equipment type, then the following number of additional pieces of equipment after the initial need to be entered:

- The number of additional booster pumps
- The number of additional tugs.

5.5 Emission Offsets Inputs

If a proposed project exceeds *de minimis* emissions thresholds and emissions offsets are considered as an alternative to scheduling or design changes, the user should enter the relevant information on this tab in order to calculate approximate offset costs. The user should be aware that the regulations governing the use and availability or emissions offsets are complex, and the market for these credits is often volatile; in some cases, credits may not be available. If a project may require emissions offsets, users are urged to consult with appropriate regulators for guidance in obtaining the credits for emission offsets for the project necessary to complete the “Emi Offset Inputs” tab.

Emissions credits must be obtained from and applied within the specific nonattainment area(s) where the project-related emissions occur. Since the emission credits are filed on a state-by-state basis, emissions offsets may need to be obtained from multiple states, depending on the geographic areas where the emissions would be generated from the project. Consequently, the computation of emission offsets requires a range of additional inputs that localize the emissions.

- Dredging County
    - Depends on the dredging location specified in the Main Inputs tab
        - New York
            - Suffolk
            - Nassau
            - Queens
            - Bronx
            - Westchester
        - Connecticut
            - Fairfield
            - New Haven
            - Middlesex
            - New London

    - Rhode Island
        - Washington
        - Kent
        - Providence
        - Bristol
        - Newport

- Disposal County (for conformity regions only)
    - Depends on the disposal location specified in the Main Inputs tab
    - New York
        - Bronx
        - Kings
        - Nassau
        - New York
        - Orange
        - Queens
        - Richmond
        - Rockland
        - Suffolk
        - Westchester
    - Connecticut
        - Fairfield
        - Middlesex
        - New Haven
        - Hartford
        - Litchfield
        - New London
        - Tolland
        - Windham
    - Rhode Island
        - Washington
        - Kent
        - Providence
        - Bristol
        - Newport
    - New Jersey
        - Bergen
        - Essex
        - Hudson
        - Hunterdon
        - Middlesex

        - Monmouth
        - Morris
        - Passaic
        - Somerset
        - Sussex
        - Warren

    - Pennsylvania

        - Not Applicable

- Transport Mileage per Region (mi)

    - If total emissions within a state triggers emission offsets to be calculated, then mileage within a particular conformity region would need to be quantified. Those regions are listed below. See the workbook for the list of counties within a conformity region.

        - New York-Northern New Jersey-Long Island NY-NJ-CT 8-hour Ozone Nonattainment Area

            - New York, New Jersey, and Connecticut, individual portions

        - New York-Northern New Jersey-Long Island NY-NJ-CT Annual and Daily $PM_{2.5}$ Nonattainment Area

            - New York and Connecticut, individual portions

        - Greater Connecticut, CT 8-hour Ozone Nonattainment Area

        - Rhode Island, 8-hour Ozone Nonattainment Area

- Offset Emission Costs – Market as of November 13, 2013 ($/ton)

    - The cost indices, provided by the credit broker as of November 2013, are available to be updated based on up to date costs. They are the estimate of costs within each conformity region specified above.

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6 References

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DMD Activity Length (months):	4

Dredging Location:	Connecticut
Dredging Equipment Type:	Mechanical Dredge
Bucket Size (CY):	10
Dredge Size (HP):	
Volume of Dredged Material (CY):	100000

Disposal Method:	Containment Island
Containment Island Disposal Location:	New Haven, CT
Not Applicable	
Disposal State:	

Transport to Disposal Method:	Tug Hauled Scow
Tug Hauled Scow / Hopper Dredge / Pipeline Transport Mileage per State for Containment Island Disposal (mi):	
New York	
Connecticut	20
Rhode Island	
Not Applicable	
Not Applicable	
Tug Hauled Scow Size (CY):	2000
Not Applicable	
Not Applicable	
Not Applicable	

Not Applicable	
Not Applicable	
Not Applicable	

Legend:

(orange)	Choose from the drop down menu
(blue)	Type in the required input
(red)	Error: Input should be reset

Dredging Location:	Connecticut
Dredging Equipment Type:	Mechanical Dredge
Bucket Size (CY):	10
Volume of Dredged Material (CY):	100000
Disposal Method:	Containment Island
Disposal Location:	New Haven, CT
Disposal State:	0
Transport to Disposal Method:	Tug Hauled Scow
DMD Activity Length (months):	4

	Emissions (tons)																			
	New York				Connecticut				Rhode Island				New Jersey				Pennsylvania			
Activity	VOC	NOx	CO	$PM_{2.5}$	VOC	NOx	CO	$PM_{2.5}$	VOC	NOx	CO	$PM_{2.5}$	VOC	NOx	CO	$PM_{2.5}$	VOC	NOx	CO	$PM_{2.5}$
Dredging	-	-	-	-	13.716	10.085	0.590	0.606	-	-	-	-	-	-	-	-	-	-	-	-
Transport to dewatering	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dewatering	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transport to disposal	0.000	0.000	0.000	0.000	0.089	2.198	1.587	0.093	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Project Emissions	**0.000**	**0.000**	**0.000**	**0.000**	**13.805**	**12.283**	**2.177**	**0.700**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Average Annual Emissions	**0.000**	**0.000**	**0.000**	**0.000**	**41.415**	**36.850**	**6.531**	**2.099**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Note:

See 'Offset Emissions' tab for emissions offsets requirement (if applicable).

Volume of Dredged Material (CY):	100000
Disposal Method:	Containment Island
Not Applicable	
Not Applicable	
Transport to Disposal Method:	Tug Hauled Scow
Tug Hauled Scow / Hopper Dredge / Pipeline Transport Mileage per State for Containment Island Disposal (mi):	20

Activity	Costs
Mobilization	$ 247,500
Dredging	$ 1,350,014
Disposal Transport	$ 620,000
Disposal	$ 7,660,000
Total	**$ 9,877,514**

Dredging Location:	0
Dredging County:	0
Not Applicable	
County of Upland Dewatering:	0
Not Applicable	
Disposal Location:	New Haven, CT
Disposal State:	0
Disposal County:	0
DMD Activity Length (months):	4

Statewide Offset Emissions

	Emissions (tons)												
	New York			Connecticut					Rhode Island		New Jersey		
Conformity Region	New York Ozone (NY-NJ-CT) Conformity Region		New York Annual PM2.5 (NY-NJ-CT) Conformity Region	Connecticut Ozone (NY-NJ-CT) Conformity Region		Connecticut Ozone (Greater Connecticut) Conformity Region		Connecticut Annual PM2.5 (NY-NJ-CT) Conformity Region[1]	Rhode Island Ozone (Providence (all of RI)) Conformity Region		New Jersey Ozone (NY-NJ-CT) Conformity Region		New Jersey Annual PM2.5 (NY-NJ-CT) Conformity Region[1]
Activity	VOC	NOx	$PM_{2.5}$	VOC	NOx	VOC	NOx	$PM_{2.5}$	VOC	NOx	VOC	NOx	$PM_{2.5}$
Dredging	-	-	-	-	-	-	-	-	-	-	-	-	-
Transport to dewatering	-	-	-	-	-	-	-	-	-	-	-	-	-
Dewatering	-	-	-	-	-	-	-	-	-	-	-	-	-
Transport to disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Project Emissions	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Average Annual Emissions	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
De minimis Levels	50	100	100	50	100	50	100	100	50	100	50	100	100

Conformity Region Applicability Summary

	Emissions (tons)						
Conformity Region	NY-NJ-CT Ozone Conformity Region		NY-NJ-CT PM2.5 Conformity Region	Connecticut Ozone (Greater Connecticut) Conformity Region		Rhode Island Ozone (Providence (all of RI)) Conformity Region	
Activity	VOC	NOx	$PM_{2.5}$	VOC	NOx	VOC	NOx
Average Annual Emissions	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
De minimis Levels	50	100	100	50	100	50	100

Offset Costs

	Emissions (tons)										
	New York			Connecticut				Rhode Island		New Jersey	
Conformity Region	New York Ozone (NY-NJ-CT) Conformity Region		New York Annual PM2.5 (NY-NJ-CT) Conformity Region	Connecticut Ozone (NY-NJ-CT) Conformity Region		Connecticut Ozone (Greater Connecticut) Conformity Region		Rhode Island Ozone (Providence (all of RI)) Conformity Region		New Jersey Ozone (NY-NJ-CT) Conformity Region	
Activity	VOC	NOx	$PM_{2.5}$	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
Total	-	-	-	-	-	-	-	-	-	-	-
Costs ($/ton)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Costs	-	-	-	-	-	-	-	-	-	-	-

Notes

1) This Region is in the process of being designated as an attainment area. No emissions credit is available.